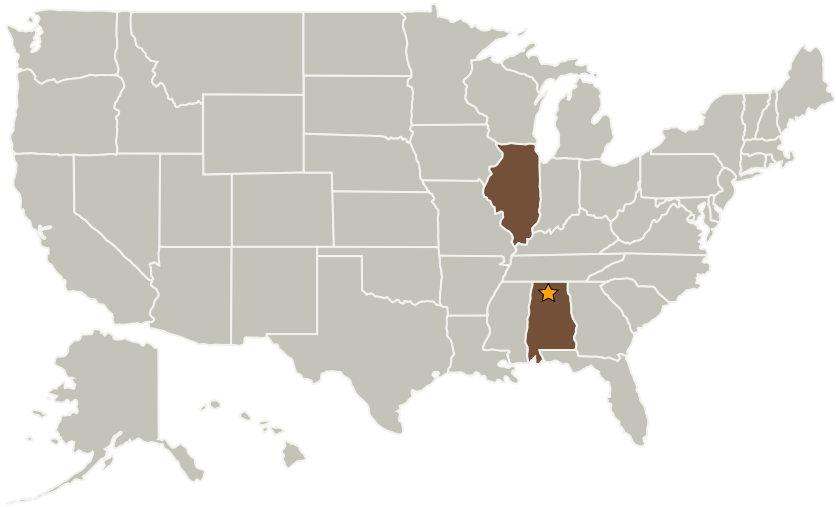
Practical Multi-Disciplinary Analysis Tools for Combustion Devices, Phase I

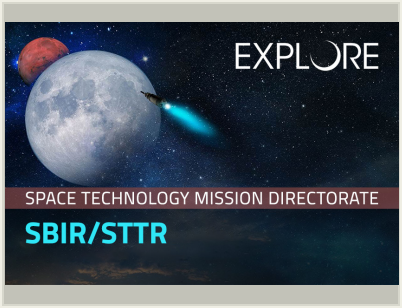
Completed Technology Project (2005 - 2006)

Project Introduction

The use of multidisciplinary analysis (MDA) techniques for complex fluid/structure interaction phenomena is increasing as proven numerical and visualization algorithms and high performance computing (HPC) platforms become more prevalent. Parallel solution methodologies and networked computing clusters are readily available, yet the challenge of bringing highly sophisticated MDA research algorithms into a fast-paced NASA engineering environment still remains. In particular, if the time accurate solution of fluid and thermal structural responses becomes practical, then significant improvements in the analysis of modern rocket engine combustion chambers and other space transportation subsystems will be achieved. Continued improvements in current research tools and further validation of physical models are needed to develop practical MDA capabilities within the growing multidisciplinary engineering community. Our research will produce an innovative MDA system based on an existing multi-physics code (CHEM) to compute the turbulent, chemically reacting flow and coupled structural heating of given configurations. Our unique approach, involving solution adaptive algorithms on generalized unstructured grids, will provide NASA with an important capability to solve fluid/structure interaction problems in a collaborative engineering environment. Furthermore, our hands-on experience with complex MDA problems will help ensure that the research product will offer NASA a significantly improved, commercially viable analysis tool.

Primary U.S. Work Locations and Key Partners





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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Marshall Space Flight Center (MSFC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Marshall Space Flight Center(MSFC)	Lead Organization	NASA Center	Huntsville, Alabama
Tetra Research Corporation	Supporting Organization	Industry Women-Owned Small Business (WOSB)	Princeton, Illinois

Primary U.S. Work Locations	
Alabama	Illinois

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Rex Chamberlain

Technology Areas

Primary:

- TX09 Entry, Descent, and Landing
  - TX09.4 Vehicle Systems
    - TX09.4.5 Modeling and Simulation for EDL